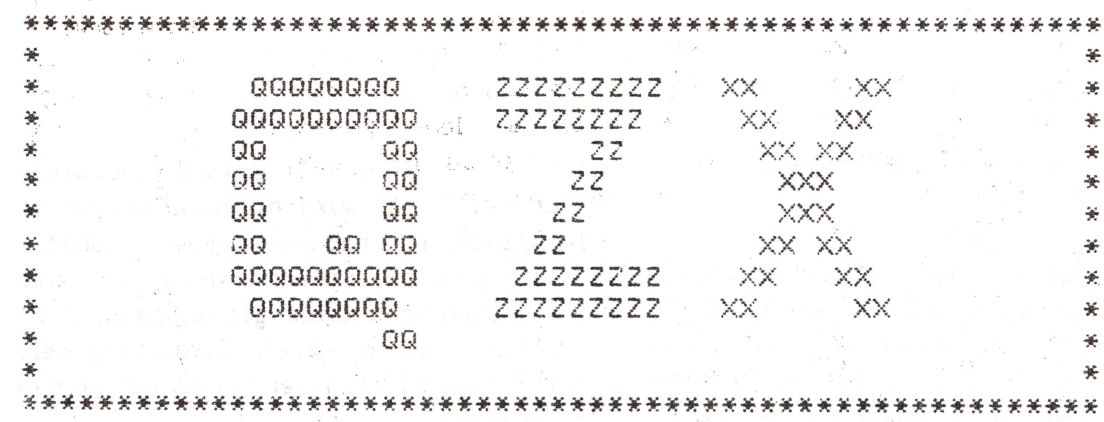

The Journal Covering Amateur Radio & Sinclair Computers
ZX80; Micro-Ace; ZX81; TS1000, 1500, & 2068; QL; Z88
Alex. F. Burr, K5XY, Publisher
2025 O'Donnell Drive
Las Cruces, New Mexico
88001

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EDITOR'S NOTES

K5XY

I was very happy to find quite a few renewal letters in my mailbox after the president's day holiday last month. There was even one new subscription, complete with an order for some back issues. Nevertheless we still lost some readers.

One of the results of my visit to the Chicago Area Timex Users Group (CATUG) meeting in Chicago last January was some more thoughts on using the TS2068 actively in amateur radio. As a result of that meeting K9WVY, Bob, asked about programs and hardware useful for WEFAX, CW, and ATV. We have published articles on packet uses but not much on these other modes. I am thinking about the TS2068 itself, not the Spectrum or the TS2068 with a spectrum ROM. If any of you have one of these computers on any of these modes, I would very much like a detailed description of the software and hardware you are using along with some information on how you are using it.

There will be a national 1990 Sinclair Computer Exposition. It will be sponsored by the Sinclair Milwaukee Users Group and held during the first weekend in June. I would really like to attend but at that time I will be getting ready to spend a few weeks in Guatamala teaching electronics. More information on the Exposition will appear in coming issues. For more information immediately, call Neal Schultz at (414) 353-4522 between the hours of 7 - 10 PM.

QZX FRIENDS

W8KBQ -- Jack bought back issues to complete his set of QZX. He also mentioned that his wife got a bargain on a Commodore 64 and that he is trying to get the satellite tracking program for his TS2068 that WA6DLI mentioned in a recent issue.

W8FXZ -- Dick renewed and wrote that he did not want his subscription to lapse because he had every issue published.

UL7FZI -- Harry wrote for some information to help him get his newly built Spectrum clone on packet. I could not help him much but I did refer him to our British counterpart.

UNCLASSIFIED ADS

WANTED: UNCLASSIFIED ADS for publication in QZX. Cost is 1 cent for each keystroke (characters, blanks, etc.). Payment must be included with order. This is an excellent way to sell your program or unwanted equipment, ask for help, or find a specific program. Send your ad with payment to QZX, 2025 O'Donnell, Las Cruces, NM 88001.

WANTED: Tasman Interface Parallel Printer Driver and software. Schematic drawing if available. Edward L. Radtke, 1602 Woodluck Ave., Louisville, KY 40205.

WANTED: Someone w/circuit board experience to put together an RS232 interface card (kit) for me. Stu Ballinger, 11 Lown Ct., Poughkeepsie, NY 12603-3321 or if local (914)452-2482 evenings bet. 8P-10 + weekends.

FOR SALE: Book "Z80 Assembly Language Programming" by Lance A. Leventhal. Published by Osborne/Mc Graw Hill 1979. Over 600 pages, new condition. Price $10 + $2 postage. Alex. F. Burr, 2025 O'Donnell, Las Cruces, NM 88001.

WANTED: Schematic for Mindware MW-100 printer. Also MLI 2.0 program for use with CWSS system. Geo. Fariss, 1214 Mages St., Las Cruces, NM 88005.

EXPLORING THE TS1000 SINCLAIR LOGIC CHIP (SCL) V

Don Lamen

This article is a continuation of the series which began in the October issue of QZX. The purpose is to explain the function of the SCL logic chip in the ZX and TS1000 series of Sinclair computers. This chip is a custom chip designed particularly for our computers. The previous articles gave some background on the chip, provided a functional diagram, and listed 17 separate functions performed by the chip. These and succeeding articles discuss these functions individually and provide an equivalent circuit diagram for the function. These circuit diagrams are only the equivalent of the actual circuits inside the chip because nothing is known about the real connections inside, but the circuits given here will perform the function of the real circuit. For a list of these 17 functions see the October issue of QZX.

INTERCEPT CONTROL CIRCUIT

The intercept control circuit controls the flow of signals on the internal data bus (and provides for screen inversion). For a possible realization of this data bus see the figure given in QZX for January. The timing and control signals come from the sources given below.

a) Counter one, main timing chain
b) A15
c) $\overline{M1}$
d) The horizontal sync generator
e) $\overline{HALT}$
f) D6
g) D7

The timing counter bits are weighted as follows:

Bit 1 -- 1
Bit 2 -- 2
Bit 3 -- 4
Bit 4 -- 8

The Intercept Control Circuit consists of the following circuits and/or components:

a) 6 timing decoders
1. Multiplex timing (Code 8 or Code NOT 8
2. Sensing (Code positive edge of 2 AND NOT 4)
3. Latch-In (Code 1 AND 2 AND NOT 4)
4. No-Op (Code NOT 2 AND 4)
5. Latch-Out (Code 2 AND 4) inverted
6. Load (Code 1 AND 2 AND 4)

b) 3 flip-flops
1. Intercept flip-flop
2. Inverse flip-flop 1
3. Inverse flip-flop 2

c) 3 reset gates
1. Intercept reset gate 1
2. Inverse reset gate 1
3. Inverse reset gate 2

d) 2 multiplexed clock gates
1. Inverse clock gate 1
2. Inverse clock gate 2

e) 1 inverse OR gate

f) 2 multiplexed shift register load gates

g) 6 inverters

Here is a description of how the intercept control circuit works.

The timing of this circuit is controlled by the first counter of the main timing chain (shown in the December QZX), which counts from 0 to 15 repeatedly except when preset. When it is preset to 2, it counts from 3 to 15 and then goes to 0 (14 counts). Each time this counter returns to 0 it puts out a Carry-Out to the next counter.

On the rising edge of the counter's T-cycle 0 (Code NOT 8), the shift registers are switched and shift register 2 becomes inhibited. On the rising edge of the counter's T-cycle 8 (Code 8) the shift registers are switched back, shift register 2 then becoming inhibited. The uninhibited register now shifts out its eight bits of data to the Video Combiner.

The inhibit signal is delayed for about a half dot cycle to give the active shift register time to shift out its last bit.

The NOT M1 signal is inverted and ANDed with the signal on A15, then fed to the 'D' input of the intercept flip-flop. At the rising edge of dot cycle 2 of the character set of 8 dot cycles, (Code 2 AND NOT 4) the signal on the 'D' input is clocked in. If NOT M1 = 0 AND A15 = 1, the intercept flip-flop is SET, otherwise it is RESET. SETing the intercept flip-flop enables the rest of the timing gates, except for MUX, which is always enabled.

During dot cycle 3 (Code 1 AND 2 AND NOT 4) the data on the data bus lines D0 through D5 will be latched into the internal latch and the contents of D7 will be clocked into inverse flip-flop 1 if Code NOT 8 or into inverse flip-flop 2 if Code 8. However, if D6 = 1 (or NOT HALT = 0 or during horizontal sync), then the intercept flip-flop will reset, disabling the intercept and allowing the Z80 to read the HALT instruction as usual.

During dot cycles 6 and 7 (Code 2 AND 4), while the Z80 is decoding the No-Op instruction and refreshing the memory, the intercept circuit enables the tri-state output buffer (ROM driver), putting the output of the character scan line counter on address lines A0' through A2' and the latched data (character code) on address lines A3' through A8'. At the same time the address lines A9 through A15 contains a copy of the contents of the I register. This accesses the dot code from the ROM, which the ROM places on the data bus.

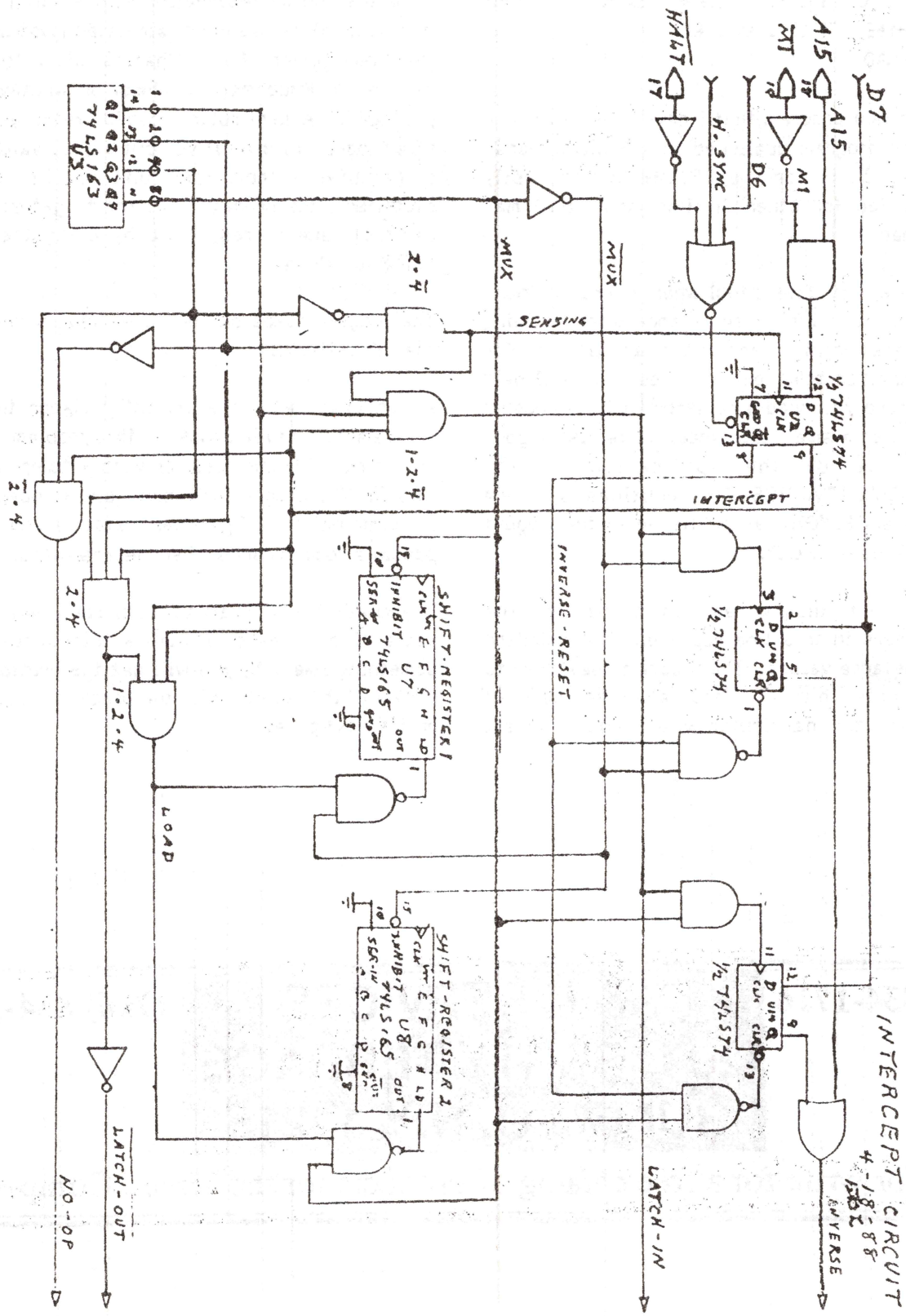
During dot cycle 7, the 8 bit dot code on the data bus is loaded into the inhibited shift register.

During dot cycle 8, the shift registers are switched and the same operations are repeated, but on the opposite shift register.

A possible realization of this intercept control circuit appears on the next page.

Next month will feature more details on some of the circuits included in the internal bus diagram shown in the October issue of QZX.

ZX81/TS1000


D7
A15
A15
M1
D6
H-SYNC
HALT
MUX
MUX
SENSING
INTERCEPT
INVERSE-RESET
LOAD
LATCH-IN
LATCH-OUT
NO-OP
INVERSE
1/2 74LS74
SHIFT-REGISTER 1
SHIFT-REGISTER 2
74LS163
INTERCEPT CIRCUIT
4-18-88

R CALCULATOR FOR THE TS1000

LU8MAD

This is a program that I have adapted from a basic program published in a Holland magazine. It is for the TS1000 but is easily modified for other Sinclair (and clone) machines.

It is a very useful tool when you need a non-standard value of resistance when building filters from operational amplifiers for modems or other exacting uses. It will help anytime you need a resistor with an unusual value or a small tolerance. It is also a good example of the application of the READ/DATA/RESTORE routines by Clem Wehner, K5KGM, as published in the August 1985 issue of QZX.

The key to the program lies in line 100. The numbers in this line represent the standard resistance values. The program uses them to calculate which standard values can be used to get the particular value you request. Note that no decimal value is given in this list. All values used and calculated must use the same power of 10. That is, all values must be in kiloohms, megohms, or whatever you need. A particularly useful feature of this program is that, if you put any 12 values of resistance from your junk box in this statement, the program will try to get your desired value of resistance by using these junk box values.

The program takes one or more minutes to do the calculations.

As an example of the amount of labor this program can save, consider the problem of obtaining a 71 ohm resistor with a tolerance of 5 %. The program will print out 31 possible combinations of parallel resistors and 23 possible combinations of series resistors.

If you ask the program to calculate a way to get a 72 ohm resistor with a tolerance of something like 1 %, you will get the printout shown in the figure after the program listing on the next page.

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```
  1 REM
  2 DIM R(13)
  6 LET N=1
 10 RAND USR 16514
 20 LET A$=""
 30 RAND USR 16556
 40 IF A$="END" THEN GOTO 104
 45 LET N=N+1
 50 LET R(N)=VAL A$
 60 GOTO 20
100 REM 1,1.2,1.5,1.8,2.2,2.7,3.3,3.9,4.7,5.6,6.8,8.2,END,
104 PRINT "<<<<<<<<<<<<<PARSER>>>>>>>>>>>>>"
110 PRINT
112 LET X=1
114 LET Y=1
120 PRINT "RESISTANCE ? "
122 INPUT R
124 PRINT AT 3,12;R;" OHMS"
126 IF R<.5 OR R>16400000 THEN GOTO 130
128 GOTO 136
130 PRINT AT 5,8;"OUT OF RANGE"
132 CLS
134 GOTO 104
136 PRINT AT 6,0;"TOLERANCE ( 0/0) ?"
138 INPUT T
140 PRINT AT 6,26;T
142 LET L=R-(T/100)*R
144 LET U=R+(T/100)*R
145 PRINT AT 8,0;"FROM ";L;" TO ";U;" OHMS"
146 FAST
147 LET Q$="//"
148 PRINT AT 10,0;"PARALLEL RESISTORS"
149 PRINT AT 11,0;
150 FOR Z=1 TO 7
152 FOR M=1 TO 12
154 IF R(M)*X>2*U OR R(M)*X<X THEN GOTO 194
156 FOR W=1 TO 7
158 FOR N=1 TO 12
160 IF R(N)*Y<R THEN GOTO 186
162 LET P=R(M)*X*R(N)*Y/((R(M)*X)+(R(N))*Y)
164 IF P<L OR P>U THEN GOTO 186
166 LET T1=((100*P/R)-100)*1000
168 LET T1=INT (T1)/1000
170 LET R1=R(M)*X
172 LET K$=""
174 LET S$=""
176 IF X>100 THEN LET R1=R1/1000
178 IF X>100 THEN LET K$="K"
180 IF X>100000 THEN LET R1=R1/1000
182 IF X>100000 THEN LET K$="M"
183 GOSUB 2000
185 PRINT ;R1;K$;" ";Q$;R2;S$;" = ";(INT (P*100))/100;" ";T1;" 0/0"
186 NEXT N
188 LET Y=Y*10
190 NEXT W
192 LET Y=1
194 NEXT M
196 LET X=X*10
198 NEXT Z
200 LET X=1
210 LET Y=1
220 PRINT AT 16,0;"SERIE RESISTORS"
222 LET Q$="+"
224 FOR Z=7 TO 1 STEP -1
226 FOR M=12 TO 1 STEP -1
228 IF R(M)*X<L/2 OR R(M)*X>R THEN GOTO 1090
230 FOR W=7 TO 1 STEP -1
232 FOR N=12 TO 1 STEP -1
234 LET P=R(M)*X+R(N)*Y
1000 IF P<L OR P>U THEN GOTO 1080
1010 LET T1=((100*P/R)-100)*1000
1015 LET T1=INT (T1)/1000
1020 LET R1=R(M)*X
1022 LET K$=""
1024 LET S$=""
1030 IF X>100 THEN LET R1=R1/1000
1032 IF X>100 THEN LET K$="K"
1040 IF X>100000 THEN LET R1=R1/1000
1042 IF X>100000 THEN LET K$="M"
1050 LET R2=R(N)*Y
1052 IF Y>100 THEN LET R2=R2/1000
1054 IF Y>100 THEN LET S$="K"
1060 IF Y>100000 THEN LET R2=R2/1000
1062 IF Y>100000 THEN LET S$="M"
1070 PRINT ;R1;K$;" ";Q$;R2;S$;" = ";P;" ";T1;" 0/0"
1080 NEXT W
1082 LET Y=Y*10
1084 NEXT W
1086 LET Y=1
1090 NEXT M
1092 LET X=X*10
1100 NEXT Z                                   QZX 1990 MARCH
1120 PRINT AT 21,0;"OTHER COMPUTE ? (Y / N)"
1122 INPUT J$
1130 IF J$="Y" THEN GOTO 3000
1140 IF H$="N" THEN STOP
1150 GOTO 1130
2000 LET R2=R(N)*Y
2002 IF Y>100 THEN LET R2=R2?1000
2004 IF Y>100 THEN LET S$="K"
2006 IF Y>100000 THEN LET R2=R2/1000
2008 IF Y>100000 THEN LET S$="M"
2010 RETURN
3000 CLS
3005 SLOW
3010 RUN
3020 REM PARSER ADAPTED TO TS1000
        BY LUBMAD - 1989
```

```
<<<<<<<<<<<<<PARSER>>>>>>>>>>>>>

RESITANCE ? 72 OHMS

TOLERANCE (0/0) ?          1

FROM 71.28 TO 72.72 OHMS

PARALLEL RESISTORS
120 //180 = 72 0 0/0



SERIES RESISTORS
68 +4.7 = 72.7 0.972 0/0
68 +3.9 = 71.9 -0.139 0/0
68 +3.3 = 71.3 -0.973 0/0
39 +33 = 72 0 0/0
OTHER COMPUTE ? (Y / N)
```

Fig 1

73, K5XY

QZX presents the best software & hardware projects available for the radio amateur. While the contents are believed to be accurate, no warranty is extended on any program or project. No investigation has been made of the claims or reputation of any advertiser. It would be greatly appreciated if all correspondence requiring an answer would be accompanied by a self-addressed stamped envelope (SASE). Copyright by QZX, 1990. All rights reserved, photocopying by permission only.

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